THEORY OF COMPUTATION
SET – 4

SOLUTIONS

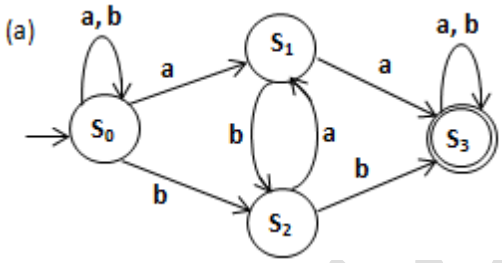
1. Consider an ambiguous grammar G and its disambiguated version D. Let the language recognized by them are L(G) and L(D) respectively. Which one is true?

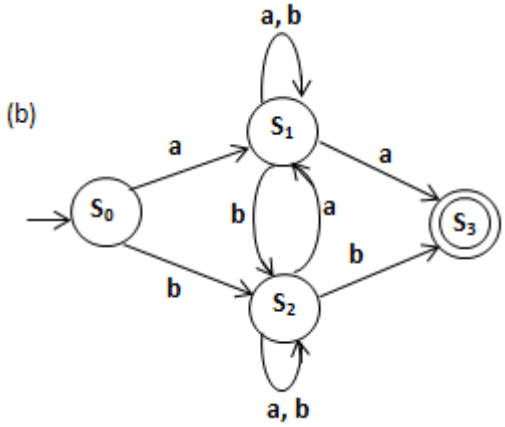
(a) L(D) < L(G)
(b) L(G) < L(D)
(c) L(D) = L(G)
(d) L(D) is empty

Solution: Option (c)

2. Consider R = (a + b)* (aa + bb) (a + b)*

Which of the following NFA recognizes the language defined by R?





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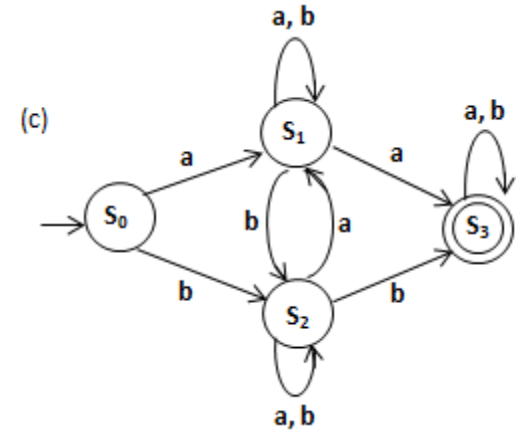
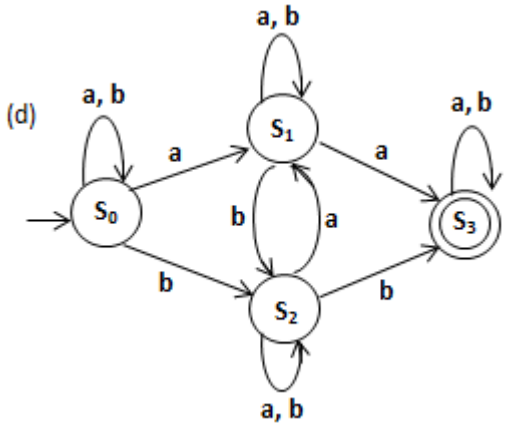
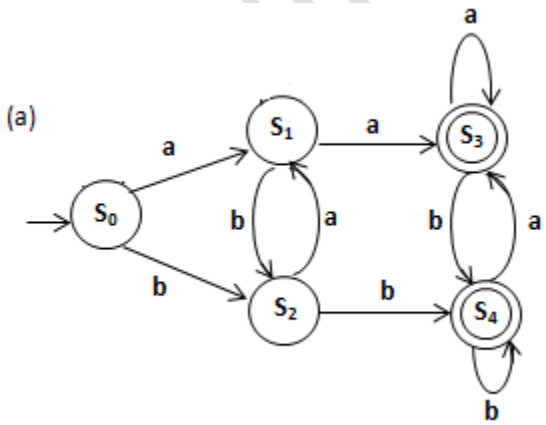




Solution: Option (a)

3. Which of the following DFA accepts same language accepted by R = (a + b)* (aa + bb) (a + b)* ?



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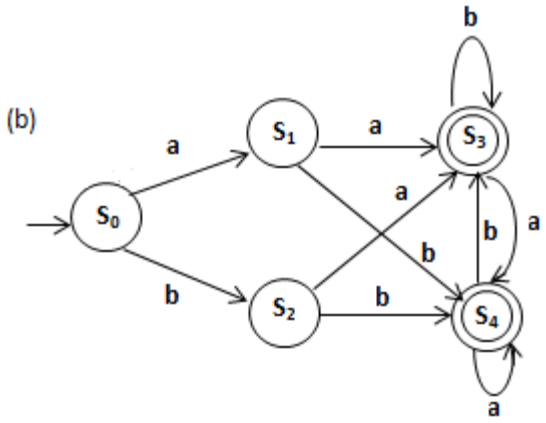
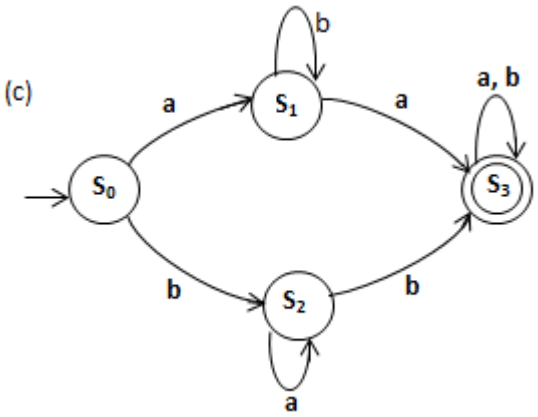
(b)



(c)



(d) None of above

Solution: Option (a)

4. Which one of the Regular Expression given defines the same language as defined by R = (a + b)* (aa + bb) (a + b)* ?

(a) (a (ba)* + b (ab)*) (a + b)*
(b) (a (ba)* + b (ab)*)* (a + b)*
(c) (a (ba)* (a + bb) + b (ab)* (b + aa)) (a + b)*
(d) (a (ba)* (a + bb) + b (ab)* (b + aa)) $(a + b)^+$

Solution: Option (c)

Explanation:

This is the DFA for the regular expression R, use state – elimination method to transform the DFA to regular expression.

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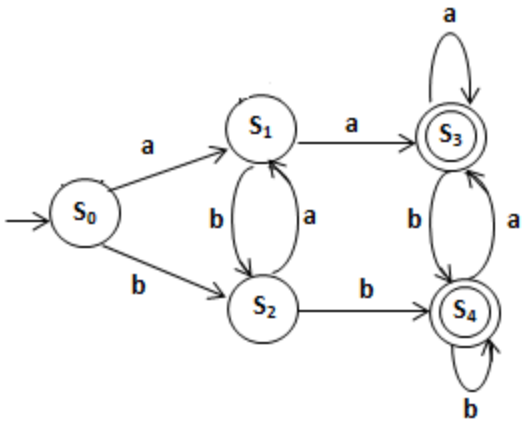

5. For $n \geq 0$, $L_n = \{a^i b^k \mid i \geq n, 0 < k < i\}$

(a) L_n is regular, independent of value of n
(b) L_n is not regular, independent of value of n
(c) L_n is regular only for small value of n
(d) None of above

Solution: Option (b)

Explanation:
b is depending on *a* and number of *a*'s are unbounded.

6. Let L_1 be an infinite regular language. Let L_2 be an infinite set such that $L_2 \subset L_1$.

(a) L_2 is definitely regular because L_1 is Regular
(b) L_2 is never regular because L_2 is infinite
(c) L_2 may or may not be regular
(d) None of above

Solution: Option (c)

Explanation:
Take $L_1 \rightarrow (0+1)^*$
L_2 can be $\{0^n 1^n, n > 1\}$

7. Consider $L_1, L_2 \subseteq \Sigma^*$ such that L_1 and $L_1 \cup L_2$ are regular.

(a) L_2 is definitely regular
(b) L_2 may not be regular

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(c) L_2 is context free

(d) None of above

Solution: Option (b)

Explanation:
Take $L_1 = (a + b)^*$

L_2 could be either regular or non-regular.

8. w_R denotes the reverse of w. For $L \subseteq \Sigma^*$, $L_R = \{w_R \mid w \in L\}$. Suppose L_R is not regular. Then,

(a) L is definitely regular

(b) L may or may not be regular

(c) L is definitely not regular

(d) None of above

Solution: Option (c)

Explanation:
If L_R is regular, L has to be regular.

9. Consider these 2 statements:

S_1: $a^*. \phi = a^*$
S_2: $\phi^* = \phi$

(a) Both are False

(b) Both are True

(c) $S_1 \rightarrow T$, $S_2 \rightarrow F$

(d) $S_1 \rightarrow F$, $S_2 \rightarrow T$

Solution: Option (a)

Explanation:
$\phi^* = \in$
$a^*\phi = \phi$

10.

Statement I: L_i be regular language i = 1, 2, . . ., ∞
Language $\bigcap_{i=1}^{\infty} L_i$ is regular i.e. Infinite intersection.

Statement II: $L = \{wx \mid w \in \Sigma^*, x \in \Sigma^*, |w| = |x|\}$ is regular.

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(a) Both are True
(b) Both are False
(c) $S_1 \rightarrow$ True, $S_2 \rightarrow$ False
(d) $S_1 \rightarrow$ False, $S_2 \rightarrow$ True

Solution: Option (d)

Explanation:

For Statement1, take

$L_1 = a^* - a^0$
$L_2 = a^* - a^1$
$L_3 = a^* - a^4$
$L_4 = a^* - a^6$
$L_5 = a^* - a^8$
:
:

considering all non-primes

After taking their intersection, we will get like this.

$L = \{a^p, p \text{ is prime}\}$ which is not Regular

For Statement 2:

L is nothing but language of even length strings.

R.E. = (00 + 01 + 10 +11)*

So, L is regular.

Ravindrababu Ravula